

Amendment and Response

Applicant: Johannis Cornelis Slabbeboom et al.

Serial No.: 10/587,883

Filed: July 27, 2006

Attorney Docket No.: CGL04/0034US01

Title: PROTEIN CONCENTRATE AND AN AQUEOUS STREAM CONTAINING WATER-SOLUBLE CARBOHYDRATES

CLAIMS:

In the Claims, Claims 8, 14, 15, 19, 22-26, 30-35, and 38-41 are cancelled. Claims 1-7, 9-13, 16-18, 20-21, 27-29, 36-37, and 42 are currently amended. Claims 43-50 are newly presented. Accordingly, Claims 1-7, 9-13, 16-18, 20-21, 27-29, 36-37, and 42-50 are currently pending. This listing of claims will replace all prior versions and listings of claims in the application and is provided as a convenience to the Examiner.

1. (currently amended) A continuous process for producing a protein concentrate from a grain comprising the steps of:
 - (a) steeping the grain in water and sulphur dioxide under conditions that soften the grain thereby producing a steeped grain kernel;
 - (b) ~~degerminating~~ degerming the steeped grain to produce kernel thereby producing a degermed grain kernel;
 - (c) removing fiber from the degermed grain ~~to produce kernel thereby producing a starch-protein mixture~~;
 - (d) separating ~~, mechanically or physically,~~ the starch-protein mixture ~~to produce~~ thereby producing a starch fraction and a protein fraction, the protein fraction comprising one or more protein-containing materials and one or more starchy materials, wherein the one or more protein-containing materials comprise remaining starch molecules;
 - (e) ~~contacting the one or more protein-containing materials with one or more wet-mill streams and one or more carbohydrases adding carbohydrase to hydrolyze the remaining starch molecules~~ the protein fraction, thereby producing at least one protein concentrate and at least one providing the starchy materials into an aqueous stream containing enriched with water-soluble carbohydrates; and (f)

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- (f) ~~separating the protein-concentrate~~ protein-containing materials from the aqueous stream ~~containing-enriched with the~~ water-soluble carbohydrates, thereby producing the protein concentrate; and
- (g) ~~contacting the aqueous stream enriched with the water-soluble~~ carbohydrates with the starch-protein mixture.
2. (currently amended) ~~A-The~~ process according to claim 1, further comprising defatting the ~~one or more protein-containing-material~~ materials.
 3. (currently amended) ~~A-The~~ process according to claim 2, wherein defatting the protein-containing ~~material-materials~~ comprises contacting the protein-containing material-materials with a solvent.
 4. (currently amended) ~~A-The~~ process according to claim 2, wherein defatting the protein-containing ~~materials-material~~ comprises contacting the protein-containing materials-material with an enzyme.
 5. (currently amended) ~~A-The~~ process according to claim 1 ~~or 20~~, wherein the one or more protein-containing materials comprises corn gluten.
 6. (currently amended) ~~A-The~~ process according to claim 1, further comprising ~~a step of~~ bleaching the protein concentrate.
 7. (currently amended) ~~A-The~~ process according to claim 1 ~~or 20~~, wherein ~~at least one of the one or more wet-mill streams is~~ the aqueous stream enriched with the water-soluble carbohydrates further comprises steep liquor, light steep water, heavy steep liquor, or mixtures thereof.
 8. (cancelled)
 9. (currently amended) ~~A-The~~ process according to claim 1, wherein ~~at least one of the one or more protein-containing materials is selected from the group consisting of light~~

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gluten fraction, heavy gluten fraction, corn gluten concentrate, corn gluten meal, gluten cake, dewatered gluten, and mixtures thereof.

10. (currently amended) ~~A-The~~ process according to claim 1 ~~or 20~~, wherein step at least one of steps (e) or and step (f), respectively, takes place at a temperature of at least about room temperature.
11. (currently amended) ~~A-The~~ process according to claim 1 ~~or 20~~, wherein the process ~~comprises a further comprising filtering using a membrane filtration step before and/or after step before at least one of step (f) or and step (g), respectively.~~
12. (currently amended) ~~A-The~~ process according to claim 1, further comprising the step of drying the protein concentrate.
13. (currently amended) ~~A-The~~ process according to claim 1, wherein at least one of the one ~~or more carbohydrases~~ the carbohydrase is selected from the group consisting of alpha amylase, dextrinase, pullulanase, glucoamylase, hemicellulase, cellulase, and mixtures thereof.
- 14-15. (cancelled)
16. (currently amended) ~~A-The~~ process according to claim 1, ~~further comprising contacting the one or more protein-containing materials, one or more wet mill streams, and/or one or more carbohydrases with one or more pectinases wherein separating the starch-protein mixture further comprises at least one of physical separation and mechanical separation.~~
17. (currently amended) ~~A-The~~ process according to claim 1, ~~further comprising contacting the one or more protein-containing materials with one or more phytases wherein steeping the grain further comprises steeping the grain in a sulfur dioxide solution.~~
18. (currently amended) ~~A-The~~ process according to claim 1 ~~or 20~~, wherein greater than 2% of the solids in the protein-containing material ~~materials~~ are corn gluten.
19. (cancelled).

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20. (currently amended) A continuous process for producing a protein concentrate from a grain comprising corn and a corn wet milling process comprising the steps of:
- a. steeping the corn in water and ~~sulphur~~sulfur dioxide under appropriate conditions ~~to produce, thereby producing~~ a steeped corn kernel;
 - b. ~~degerminating-degerming~~ the steeped corn kernel ~~to produce thereby producing~~ a degermed corn kernel;
 - c. removing fiber from the degermed corn kernel ~~to produce thereby producing~~ a starch-protein mixture;
 - d. separating, ~~mechanically or physically,~~ the starch-protein mixture ~~to produce thereby producing~~ a starch fraction and a protein fraction, the protein fraction having one or more protein-containing materials and starchy materials;
 - e. ~~contacting the one or more protein-containing materials with an aqueous stream of a wet-milling process;~~
 - f. ~~adding an effective amount of carbohydrase for converting starchy material in the protein-containing materials~~ to the protein fraction thereby providing the starchy material into an aqueous stream enriched with water-soluble carbohydrates, wherein the carbohydrase is an amylase; and
 - f. ~~separating the protein concentrate at least one of the protein-containing materials from an the aqueous stream enriched with the water-soluble carbohydrates,~~ thereby producing the protein concentrate;
 - g. contacting the aqueous stream enriched with the water-soluble carbohydrates with the starch-protein mixture.
21. (currently amended) A The process according to claim 20, wherein step (g) is carried out further comprising separating the starch-protein mixture at a temperature greater than 45°C.

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22-26. (cancelled)

27. (currently amended) ~~A-The~~ process according to claim 21 ~~or 26~~, wherein microbial growth is substantially inhibited.
28. (currently amended) ~~A-The~~ process according to claim 4 ~~or 20~~, further comprising performing a filtration step to remove components greater than 75 µm before at least one of step (f) or and step (g), respectively.
29. (currently amended) ~~A-The~~ process according to claim 4 ~~20, wherein the further comprising adding~~ carbohydrase ~~is added~~ in the form of malted grain.

30-35. (cancelled)

36. (currently amended) ~~A-The~~ process according to claim 20, wherein at least one of the ~~one or more~~ protein-containing materials is selected from the group consisting of light gluten fraction, heavy gluten fraction, corn gluten concentrate, corn gluten meal, gluten cake, dewatered gluten, and mixtures thereof.
37. (currently amended) ~~A-The~~ process according to claim 20, further comprising ~~the step of drying the protein concentrate~~ on a fluid bed dryer or a ring dryer.

38-41. (cancelled)

42. (currently amended) ~~A-The~~ process according to claim 20 ~~4~~, wherein the ~~one or more~~ carbohydrases ~~carbohydrase~~ is at least one of a liquefaction enzyme and a saccharification enzyme that facilitates degradation of the starchy material thereby producing the water-soluble carbohydrate.
43. (new) The process according to claim 42, wherein the carbohydrase comprises at least one of alpha amylase, dextrinase, pullulanase, glucoamylase, hemicellulase, cellulase, and mixtures thereof.

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44. (new) The process according to claim 43, wherein the total sugars in the protein-containing materials comprise greater than 90% sugars of DP 1-14 with a composition of at least 90% sugars of DP 1-4.
45. (new) The process according to claim 43, wherein the protein-containing material have a carbohydrate profile wherein at least 10% sugars of the sugars of DP 1-13 are sugars of DP 5-13.
46. (new) The process according to claim 43, wherein the protein-containing materials have a lower proportion of sugars of DP 1-4 than sugars of DP 5-13.
47. (new) The process according to claim 46, wherein the protein-containing materials comprises sugars of DP 1-4 in an amount of about 30% and sugars of DP 5-13 in an amount of about 70%.
48. (new) The process according to claim 46, wherein the protein-containing material have a carbohydrate profile wherein the sugars of DP 1-13 are alpha 1-4 linked dextrose.
49. (new) The process according to Claim 43, wherein adding carbohydrase further comprises adjusting the pH of the protein fraction to about pH 4.2-6.0.
50. (new) The process according to Claim 49, wherein adding carbohydrase further comprises adjusting the pH of the protein fraction with NaOH to about pH 4.2-6.0.